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*On the VITAL and SANITARY STATISTICS of our EUROPEAN ARMY  
in INDIA, compared with those of FRENCH TROOPS under like  
conditions of CLIMATE and LOCALITY. By JAMES BIRD, M.D.*

[Read before Section (F) of the British Association, at Newcastle, August, 1863.]

IF the progress of intelligence and advance of civilization have widened the source of some diseases, by developing to a greater extent the fatal results of vicious habits and disorderly passions among the multitude, some compensation for such will be found in the present advanced state of the several sciences, and more particularly of preventive and curative medicine, to which statistics have been successfully applied, in proof of the deductions that are made in regard to health. The practical application of the precepts of *hygiène*, by removing the sources of many diseases, has rendered them less frequent, and less fatal, in all climates, than they proved to be in former ages. Since the beginning of the present century, a remarkable and advantageous change has been thus effected; and, through such means, the ravages of epidemic diseases, and the mortality-rate of prisons, hospitals, and poor houses, existing for the use of our civil population, have been greatly diminished. Thus the disturbing influence of burial-grounds, filthy and undrained localities in London, of the seasons, and over-crowding on the life of man, which gave rise to prevailing diseases from the plague years 1593, 1603, 1625, 1636, and 1665 to that of 1838, have been so far ameliorated, according to the second report of the Registrar-General, as to cause a reduction of the mean mortality, from 25 to 2·81 per cent.\* In proportion also as the salubrious condition of London has been improved, the distribution of deaths, among the various periods of the year, has been more and more equalized, till the maximum of mortality for late years has ceased to correspond, as formerly, to the hot months of July, August, and September.

What has been so happily accomplished for the improved health and comfort of our civil population, can in a great measure be secured for our soldiers, both at home and abroad. The practical measures carried out after the Report of the Commissioners, appointed in 1857, to examine into the condition and administration of our army hospitals, and into the operation of regulations in force to prevent disease in our army, both at home and abroad, have been followed

\* "Second Report of the Registrar-General," p. 89, London, 1840.

by a reduction in the rate of mortality of our infantry, at home, from 15·5 per 1,000 effective men in 1828, to 8·77 in 1859 and 1860.\* Dr. T. Graham Balfour's report, for this last year, has also stated the mortality of infantry of the line at home, for fifteen years, 1839-53 inclusive, to have been 16·9 per 1,000. But for the credit of the medical department of the royal army, the fact must not be passed over, that the army statistical reports, begun in 1835 by Mr. Henry Marshall, Deputy Inspector General of Hospitals, while associated with Lieutenant Tulloch, 45th Regiment (now Major-General Sir A. M. Tulloch, K.C.B.), and continued by the latter, with the assistance of Dr. T. Graham Balfour (now Deputy Inspector General of Hospitals), first called attention to the condition of the soldier in regard to health, and the various deteriorating agencies which affected it. These reports led to the expediency of establishing the Registrar-General's Department, through which accurate information, on the extent and causes of mortality among the civil population, has been obtained. In 1838 the Commissioners' report, on the sanitary condition of the British army, was published and laid before Parliament, followed by that on the organization of the Indian army in 1859; and in this the present year, 1863, we are favoured with the very valuable and elaborate report of the Commissioners, appointed in 1859, to inquire into the sanitary state of the army in India.

In endeavouring to bring before you a short digest of the important information, collected in these volumes, regarding the influence of hot climates on the health of Europeans, and more particularly India, I propose to make free use of these reports, and of the statistical, sanitary, and medical reports of the army medical department, for the years 1859 and 1860; as well as the collateral information, obtainable from the various reports on the mortality and sickness of English troops in India, published in the several volumes of the Statistical Society's *Journal*. For the facts on which a comparison may be made between the sanitary statistics of English and French troops, in hot climates, I shall chiefly have recourse to those supplied by M. Boudin in his "*Traité de Géographie et de Statistique Médicales, et des Maladies Endémiques*," Paris, 1857, and in his other publications on this subject.

We can scarcely overestimate the importance of ascertaining the causes and extent of losses sustained by armies, even in their native country, and in times of peace, from the ravages of disease; inasmuch as we cannot otherwise determine the expense

\* The former is the death-rate of troops serving in Ireland for thirty-two years, from 1797 to 1828. See Boudin's "*Statistique de la Mortalité des Armées de Terre et de Mer*," Paris, 1846, p. 2, and Dr. Balfour's "*Statistical Report for 1860*," p. 13, where the mean of the two years is as stated.

of efficiently maintaining them, both at home and abroad. Independently of the annual decrements in armies, produced by various contingencies, as the good and bad materials that compose them, their ever-varying conditions under service, according to time and place, we must endeavour to fix the rates of their losses from disease, according to age and climate, and their ever variable reductions by war and invaliding. Military service, when performed under apparently most salubrious conditions of both locality and climate, whether at home or abroad, is generally found associated with a higher rate of mortality than that incident to the indigenous inhabitants of the soil; and as this difference is not so strongly marked among officers, subject to like climatic influences, as among the non-commissioned officers and men, it is for the most part produced by a greater amount of intemperance and other vicious habits among the latter, and by overcrowding in the barracks. The proof of this will be manifest from the following ratios of mortality among the civil male population of England and Wales generally, of the officers of the royal artillery serving in England during the year 1860, and of the infantry of the line from 1839 to 1853 :—

	Mean Mortality, per 1,000.
Civil male population, England and Wales generally* .....	9·28
Officers of the foot artillery, at home, 1860.....	7·04
Infantry of the line, at home, for fifteen years, 1839-53 ....	16·8

The proportion of mortality among the civil population of France, between 20 and 30 years of age, rises to 12 per 1,000; that of the infantry of the army at home, 22·3 per 1,000,† and of the non-commissioned officers 10·8.

Since the sickness and sanitary condition of armies, therefore, may be derivable from mixed causes of locality, overcrowding in barracks, meteorological climate, dietetic errors, and vice, it is necessary to carefully sift and separate such mixed causes, and assign to each their due influence, in the production of increased ratios of military sickness and mortality. Much may be otherwise laid to the deteriorating influences of climate, which are only effects of insalubrious localities, overcrowding, dietetic errors, and vicious habits.

Sickness and increased ratios of mortality among European masses, removed to new climates, seem inseparably associated with

\* The data for England and Wales generally, have been obtained from Dr. Farr's life table, in the twelfth volume of the Registrar-General's "Reports," and from the "Army Statistical and Sanitary Report," 1860, p. 141, and Table 55 in Appendix to the Sanitary Commissioners' Report "On the Regulations affecting the Sanitary Condition of the Army," London, 1858, p. 476.

† M. Boudin's "Statistique Médicale des Armées," p. 8, and "Statistique de l'Etat Sanitaire et de la Mortalité des Armées de Terre et de Mer," Paris, 1846, p. 16.

smaller numerical degrees of latitude, as we advance nearer the Equator; and even in France we find that, for the provinces of its northern latitudes, the average mortality is 1 in 44, but for those of the south 1 in 33. How much more then must such averages increase among English troops, serving in the tropical climates of India, or of French troops in other hot climates, under like insalubrious conditions. The localities occupied by either, and which come properly under the denomination of hot climates, lie from the equator to the thirtieth and sometimes the thirty-fifth degree of north or south latitude. In Asia, and regions of the south, these are India on this side and beyond the Ganges, Ceylon, Arabia, Persia, and Cochin China; in North Africa, Algeria, and on the west Senegal; and to the south, the African islands of Réunion, Mauritius, Bourbon, and Madagascar; and in South America, Guiana, the French Antilles, or Martinique and Guadeloupe, and the English Antilles, or islands in the Gulf of Mexico, with all that part of our possessions called the West Indies.

It is not less evident, from Dr. Forry's report of the sickness and mortality in the army of the United States, that the ratios of military mortality in that country increase, as we proceed from the north to the south:—

North .....	18·8	deaths for 1,000	effective strength.
South .....	52·3	„	„
Centre .....	44·2	„	„

the causes for such increase being the combined insalubrious agencies of increased temperature and malarious localities. The greatly increased proportion of *miasmatic endemic diseases*, which we find admitted into hospitals from such places, clearly indicates that they have their origin more from endemic influences of locality, than the peculiar meteorological condition of the climate. It was for these reasons I stated in my evidence before the Royal Commission, appointed in 1859, “that in *tropical latitudes* the mortality must be “higher than in *temperate latitudes*, even after all that may be done “for the troops by the very best prophylactic measures, both *endemic* “and *dietetic*.”

After these preliminary observations on the mortality and sanitary state of English and French troops, employed in their native country, I proceed to briefly consider their relative mortality, and sanitary condition, when serving in *tropical climates*, more particularly India: and for the state of the former, past and present, I cannot do better than refer for information to the “Report of the Royal Sanitary Commission,” just published.

The ratios of mortality, deduced from given numbers of men, are at once the measure of their lives, and the healthiness of the places

they inhabit. They differ for the different countries of Europe, and for the localities, according to the greater or less salubrity of particular regions and their geological formation; and are always lower for the indigenous inhabitants of the soil, than for those who migrate there from other countries. Those for Europeans, exposed to the climatic vicissitudes of military life, and other contingencies of service, show an increase, in proportion to the proximity of residence to the equator, and unremoved sources of endemic disease there, as bad water, bad drainage, filthy locality, overcrowded and ill-constructed barracks, in combination with dietetic errors, vice, intemperance, and want of suitable clothing, occupation, and exercise, according to the conditions of climate and seasons. It would be quite impossible, amidst such extended subjects of inquiry, to select more than a tithe of them for illustration on this occasion; and I shall, therefore, confine myself to the three following heads:—

1st. Mortality, and other ratios of decrement of the effective strength of European troops, serving in India, and other hot climates.

2nd. The sanitary ameliorations of the sickness and mortality effected of late years.

3rd. The sanitary measures still necessary for application to English troops in India.

TABLE I.—*Annual Rate of Mortality in Periods of Years, from 1770 to 1856, in each of the Indian Presidencies.*

Years.	Deaths Annually to 1,000 Strength.				Remarks.
	Bengal.	Bombay.	Madras.	India.	
1770–1800 ....	70·6	78·2	37·5	54·7	{ The siege of Seringapatam and conquest of Mysore { General war in the Carnatic { Conquest of Dutch and French islands, Mahratta war, and cholera { Burmese war
1800–10 .....	91·5	84·5	54·8	73·7	
'10–20 .....	68·7	99·6	97·0	84·8	
'20–30 .....	84·5	97·9	95·2	90·7	
'30–40 .....	60·1	46·3	55·5	55·7	
'40–50 .....	79·5	68·3	43·5	65·4	
'50–56 .....	67·8	31·1	44·3	50·7	
Total .....	—	—	—	67·9	

*Note.*—This table is copied from Table 10 of the *Précis* of the “Commissioners’ Report of the Sanitary State of the Army in India,” London, 1863, p. 178.

According to this table, copied from No. 10 in the Appendix to the “Report of the Commissioners on the Sanitary State of the

"Army in India," the average rate of military mortality there, for eighty-six years, is given at 67·9 per 1,000; being at the same time stated, in the body of the report, at 69 in 1,000 during the present century. The following are the words of the report:—"The deaths in the fifty-six years, 1800-56, among all the Company's non-commissioned officers and men, including invalids, in India, amounted to 40,420 out of an aggregate of 588,820 years of life, obtained by adding up the average annual strength in those years; so the annual rate of mortality has been 69 in 1,000 during the present century.

"The mortality-rate was as high as 134 in the first Mahratta war, and it was as low as 41 in 1852. It was high again in the years of mutiny, and it has been subsequently lower than the Indian standard. From the rate of 55 in 1770-99, the rate rose to 85 in the thirty years, 1800-29; and the mortality fell to 58 in the twenty-seven years, 1830-56; so that the death-rate of the British soldier, since the first occupation of the country down to the present day, has oscillated round 69 per 1,000."

TABLE II.—*The Mortality of the French Army in Hot Climates, except Algeria, for Ten Years, from 1838 to 1847, is thus Distributed in Ratios per 1,000.*

Years.	Martinique.	Guadeloupe.	Guiana.	Senegal.	Réunion.	Average.
1838.....	79·1	192·6	48·0	152·5	32·4	110·6
'39.....	165·2	158·8	25·0	43·1	25·5	117·4
'40.....	103·5	156·9	19·1	65·5	20·0	98·4
'41.....	102·8	129·5	39·5	75·2	84·8	98·8
'42.....	86·8	42·1	26·5	62·0	30·5	52·1
1843.....	103·2	68·9	20·8	82·5	45·5	73·3
'44.....	78·0	72·1	19·2	66·2	28·1	58·8
'45.....	53·3	45·6	19·2	41·3	13·5	38·2
'46.....	93·6	25·6	16·6	27·6	19·7	37·4
'47.....	60·3	28·0	12·5	38·9	25·5	37·2
Mean ....	90·4	89·0	25·3	61·7	30·5	69·5

It is quite true that, in this next table for French troops in tropical climates, a like average of 69·5 per 1,000 is given; and the contrast is remarkable to show how much the rate is caused by hot climates and localities, and is not chiefly caused there by intemperance and vicious habits; a conclusion long since arrived at by Dr. Edward Balfour's statistics, and observations on the means of maintaining troops in health, read before the Statistical Section of this Associa-

tion, at Swansea, in August, 1848.\* It is with earnestness he protests against partial deductions on this subject, and says, "Exertions solely devoted to check intemperance, even if successful, can only palliate, but never remove, the evils that spring from climate. It may, likewise, by withdrawing attention from one great, and I believe the greatest cause of sickness, the noxious influence of particular localities, tend to retard the day, which I hope to see, when healthy sites having been selected for cantonments, the English soldier shall enjoy, in India, almost as good health as in his native country." There can be hardly a difference of opinion as to the important part vice and intemperance play, in increasing the sickness and mortality of English soldiers abroad, and for the imperative necessity "of discontinuing the sale of spirits in the canteens of India," and of adapting the soldier's diet to season and latitude. Still these unremoved sources of the sickness and mortality there, are not the main causes of the increased ratios of both; as Miss Nightingale's summary of the evidence, in the stational returns, proves† that the miasmatic diseases of fevers, diarrhoea, cholera, and dysentery, are produced under elevated temperature, by bad water, misplaced lavatories and cesspools, bad drainage, filthy bazars, and overcrowding in barracks, huts, and sick-wards.

But reverting to the mortality-rate, 69 per 1,000, as being hitherto the normal one for sickness and disease, in India, it is scarcely a true representation of the deduction that should be drawn, from the facts collected in the various statistical tables, published in the Appendix to the Commissioners' own Report, sufficient allowance not being made for the increased casualties of war, cholera, and invaliding, during the period of fifty-six years, 1800-56, assumed for the basis of some of the calculations in the report. Of these fifty-six years, twenty-five, including the Sikh war, 1845-46, and the Punjaub campaign, 1848-49, were periods of war and cholera; this last disease, according to Inspector-General Burke's Indian returns, 1826-32, having for these six years increased the mortality 11·5 per 1,000 of the effective strength.‡ Besides the average difference of mortality, between the war-rate and that of peace, or 27 per 1,000, as shown in the following table for Madras troops, not having been deducted, while the rate of invaliding in India is included, and thought of no importance, the assumed average of death, and decrements from natural causes, is thus raised to 69. It was not without good reason, therefore, that the Secretary of State for India, in his place in the House of Commons, the 23rd of July last, said, "that

\* "*Journal of the Statistical Society*," vol. xii, p. 34, 1849.

† "*Royal Commissioners' Report*," vol. i, folio, p. 347.

‡ Quoted by M. Boudin, p. 52 of his "*Etat Sanitaire et Mortalité des Armées de Terre et de Mer*," Paris, 1846.



TABLE III.—*Madras Troops.*

Years.	Service.	Number of Years.	Number of Deaths.	Average Annual Mean Strength.	Annual Average Number of Deaths.	Ratio per 1,000 of Deaths to Mean Strength.
<b>WAR.</b>						
1793-98....	Carnatic .....	6	1,549	5·696	258	49
'99-1800	{ Mysore and con- quered countries }	2	1,548	6·967	774	111
1801-5 ....	{ General war in the Carnatic, con- quered countries, and the Deccan.... }	5	3,691	8·355	738	88
'10-11....	{ French and Dutch islands .....	2	1,844	13·328	922	69
'17-19....	{ Pindarie war in the Deccan, and Ma- luca in Hindo- stan .....	3	2,993	13·585	997	73
'24-26....	Burmah .....	3	3,646	10·144	1,215	119
Total .....		21	15,271	8·796	727	82
<b>PEACE.</b>						
1806-9 ....	Peace.....	4	2,645	9·318	661	70
'12-16....	Marching .....	5	3,460	12·133	692	57
'20-23 ....	Peace.....	4	2,468	10·916	617	56
'27-38 ..	" .....	12	6,221	10·660	518	48
Total .....		25	14,794	10·781	592	55

"the general conclusion as to the mortality, being based on facts "going far back, does not afford a very good index of the sanitary "state of the Indian army at the present moment."\* When we turn to Table IV in the Appendix of the Report, in which the rates of mortality for periods of service in the three presidencies, 1847-56, are given, we find that 51·2 per 1,000, inclusive of other casualties, was the average annual mortality of the late East India Company's European troops for those ten years. It is stated, in a foot note to the table, that the mortality for this period was considerably below the previous average in Madras and Bombay; but it is doubtless a more close approximation to the true rate of the mortality in India, for the last twenty-six years, than the one taken for the basis of the Sanitary Commissioners Report. In Dr. T. G. Balfour's summary of the health of the royal army previous to 1859,† the following two tables give the rates for the three presidencies:—

\* "Times" newspaper of the 24th July, 1863, p. 7.

† "Statistical, Sanitary, and Medical Reports of the British Army for the "Year 1860," pp. 133 and 138, London, 1862.

	1830-37.	1838-56.
Madras .....	52'2 per 1,000	41'5 per 1,000
Bombay .....	33'1 "	60'9 "
Bengal .....	44'5 "	76'2 "
Average .....	43'3 "	59'5 " (for 26 years)

The mean of these two tables being 51'4 or the average mortality of the late East India Company's European forces, as given in the table of the report before quoted. Additional proof of this average being nearer the true one, for late years, than that assumed in the Commissioners' Report, may be drawn from the rate per cent. of invaliding for fifteen years' service.

Among the effective non-commissioned officers and men of the late Company's European forces, during the years 1847-56, as

TABLE IV.—*The Casualties in the Effective Non-commissioned Officers and Men of the Local European Forces in India during the Years 1847-56.*

Years of Service.	Strength. (Years of Life.)	Casualties.				Rate per Cent.			
		Deaths. (D.)	Invaliding. (I.)	D. + I.	All Causes.	Deaths. (D.)	Invaliding. (I.)	D. + I.	All Causes.
1 .....	14'390	938	45	983	1,547	6'52	31	6'83	10'75
1-2 .....	11'630	623	88	711	1,085	5'36	75	6'11	9'32
2-3 .....	9'220	518	83	601	872	5'62	90	6'52	9'45
3-4 .....	9'530	470	121	591	907	4'93	1'27	6'20	9'51
4-5 .....	10'120	446	128	574	871	4'41	1'26	5'67	8'60
5-10 .....	41'860	1,968	468	2,436	4,048	4'70	1'12	5'82	9'67
10-15 .....	21'440	1,131	597	1,728	2,949	5'28	2'78	8'06	13'75
15-20 .....	9'976	429	598	1,027	1,424	4'30	6'00	10'30	14'28
20 and up-wards.... }	43'090	193	779	972	1,207	6'25	25'21	31'46	39'06

*Note.*—This table is compiled from the tables of casualties of effectives in the presidencies. Under "invalided," are included here, besides the true invalids, the following casualties:—1. Discharged by purchase. 2. Discharged on account of term expired or otherwise. 3. Promoted. 4. Transferred to town major's list. 5. Transferred to other corps. 6. Deserted. 7. Missing, &c. 8. Other causes. Those on the town major's list of Bengal are included among the effectives.

given in Table IV; and which rate, 27'8, deducted from 64'3, the mean casualty-rate of the last twenty-five years, 1838-62, inclusive of invaliding and cholera, would leave the normal death-rate of late

years for India 36·5 per 1,000: the mean death-rate of our European troops in the three presidencies from 1850-54, being only 40·4.\*

According to that table, the rate per cent. for deaths and discharges, among men who had served ten to fifteen years, is 5·28 per cent.; which, when raised for 1,000, would give 52·8 as the mortality-rate. In the same table 2·78 is given as the rate per cent. of invaliding at the above period of service, and when this is raised for 1,000 it gives the other casualties of service, 27·8, the difference, as already shown, between the war and peace rates of mortality in India, previous to the year 1838. Perfect reliance cannot then, I think, be placed on the returns of the East India Company's troops, prior to this year, as the mortality-rates obtained from them include many abnormal casualties of service.

But descending from general statistical principles, for securing trustworthy conclusions on the subject of military mortality, let us enter on the statement of particular facts, regarding the increase and diminution of military death-rates for war and peace, brought together in Table V.

In this, the annual rate of mortality per 1,000, for the line forces of India, during the thirty-nine years, from 1817 to 1855 inclusive, is calculated from the table at p. 319 of the report. We here see that during the first Burmese war and the siege of Bhurtpoor, the rate rose as high as 158 per 1,000; and varied in times of peace from an average of 75 to 32·5 per 1,000. For seventeen years of war the death-rate was 80 per 1,000; and for twenty-two years of peace, 51·3: averages that correspond very nearly with those given in Table III.

But while the average mortality of the British army in India, from 1830 to 1837, was only 43·3 per 1,000, according to Dr. Balfour's summary before quoted; in the next period, from 1838 to 1856, it rose to 59·5, including the mortality from wounds and service during the Afghan war, the Cabul massacre, the Sind and Gwalior campaigns, the Sikh war, 1845-46, and the Punjaub campaign, 1847-48, with the Second Burmese war, 1852-53; and when we deduct the casualties of war and service for this last period, the mortality-rate, 42·5 per 1,000, would, I believe, be a nearer approach to the normal standard of India during peace, than the mean of the two tables, 51·4.

\* This is the mean taken from the Report of the Commissioners, appointed to inquire into the organization of the Indian Army, presented to Parliament in 1859; and has been quoted by the "Army Statistical Report, 1860," at p. 111. A well-written article, in the "Times of India," September 9th, 1863, says, "A total mortality of 2,360 men, upon a strength of 73,000, gives about 32 per 1,000 as the average of all India; the Commissioners make it 70; and we are persuaded that, if their figure be divided by 2, the result will give about the right average."

TABLE V.—*Showing the Annual Rate of Mortality per 1,000, for the European Line Forces of India, during Thirty-nine Years, from 1817 to 1855 inclusive; calculated from the Table at p. 319 of the "Sanitary Report." 1863.*

Years.	Rate of Deaths per 1,000.	Remarks.
1817.....	69	Pindaree war
1818.....	85	} Average mortality 75 per 1,000 in peace
'19.....	80	
'20.....	77	
'21.....	68	
'22.....	73	
'23.....	67	
1824.....	129	} Burmese war Siege of Bhurtpoor
'25.....	157	
'26.....	158	
1827.....	75	} Average mortality 53 per 1,000 in peace
'28.....	66	
'29.....	50	
'30.....	36	
'31.....	41	
'32.....	47	
1833.....	63	Coorg war
1834.....	70	} Average mortality 50 per 1,000 in peace
'35.....	34	
'36.....	43	
'37.....	53	
'38.....	52	
1839.....	76	} Afghan war Cabul massacre
'40.....	95	
'41.....	90	
'42.....	107	
1843.....	77	} Sind campaign Gwalior "
'44.....	81	
1845.....	124	} First Sikh war
'46.....	85	
1847.....	47	} Second Sikh war
'48.....	65	
1849.....	67	
1850.....	42	} Average 42 per 1,000 in peace
'51.....	42	
1852.....	63	} Second Burmese war
'53.....	49	
1854.....	35	} Average mortality 32.5 in peace
'55.....	30	

It was stated by Sir Charles Wood, in his speech already referred to,\* that “during the mutiny in India, the mortality in twenty “regiments which were sent from this country, but which were not “in action, was only 34 per 1,000,” which must be exclusive of war casualties, I should think; and in the next table, or No. VI, which

**TABLE VI.—Annual Rate of Mortality and Invaliding of Her Majesty's Troops serving in India, 1861, exclusive of late Honourable East India Company's Troops.**

	Bengal.	Madras.	Bombay.	Total. India.	Deaths per 1,000 Strength.
Mean effective strength, 1861 ....	37,483	10,739	83,60	57,082	—
Admitted into Indian hospitals .....	73,233	13,471	15,649	102,353	—
Number of days under treatment (average sick time to each soldier) ....	29·30	21·04	26·65	25·66	—
Deaths in Indian hospitals ..	16·42	156·	204·	2·002	35·3
Killed in battle .....	None	None	None	None	—
Deaths on board ship, on passage home, and in hospitals at home .....	66·	14·	15·	95·	1·67
Invalided.....	Returns not received	38·2	255·	Bengal returns not received	33·3
		6·37			

is a return of mortality and invaliding of Her Majesty's troops serving in India, 1861, the actual mortality in India from locality and climate is 35·3 per 1,000; the other casualties for invaliding and deaths on the passage home being 33·3. All such sources of discrepancy, as direct and indirect results from warfare, and other contingencies, must be eliminated from our statistical data before a true estimated rate of the mortality, from natural causes of locality and climate, is attainable. If such peculiarities of service are not attended to, and minutely enumerated for all comparisons, we can arrive at only vague and by no means satisfactory conclusions.

Colonel Sykes' paper,† on the Sickness, Mortality, and Invaliding in the East India Company's European and Native Troops, from

\* “Times” newspaper, 24th July, 1863.

† This, which is quoted from the *Statistical Journal*, vol. x, p. 100, forms Table 28, “Appendix of the Commissioners' Sanitary Report,” 8vo, p. 195.

1825-44, the last being the year previous to the Sikh war, gives the rate per cent. of European mortality 5·409, and that of invaliding 2·884 per cent., which rates, when raised for 1,000 men, become respectively 54·09 and 28·84. The former rate, however, includes 7·24 per 1,000 of deaths from cholera; and which, when deducted from the aggregate death-rate, leaves that of ordinary deaths from other natural causes 46·85 per 1,000. The rate for invaliding is a little higher than that I have employed for deduction, to obtain the hitherto normal rate of European mortality in India.

*The Sanitary Ameliorations of the Sickness and Mortality  
effected of late Years.*

I find, in regard to the health of the British Army at home, exclusive of the Horse Artillery, that for fifteen years, previous to 1854, the average death-rate was 14·7, and that of invaliding, 32·3 per 1,000; but that in 1860, and since the practical application of sanitary measures, adapted to climate and locality, these rates have respectively fallen to 7·32 and 21·30,\* indicating a gain to the effective strength of 18·38 per 1,000. The proportion admitted for enthetic (or syphilitic) diseases, and constantly in hospital, was 23·69 per 1,000. In the hot climates of Jamaica, Ceylon, and Mauritius, where, from the 1st of January, 1830, to the 31st March, 1837, the death-rates were 91·49 and 34·6 respectively; these had fallen, in the year 1860, to 20·2, 19·6, and 23·8 per 1,000.

With the introduction into India of improved sanitary improvements, adapted to climate and localities, with restraints on vice and intemperance, corresponding decreasing rates, to indicate augmented health among our troops, must follow as natural results. The present army medical statistics, in reference to India, as I stated in my evidence, are not of any value in determining the question of how much reduction in the rates of mortality may be ultimately effected for that country; for, when uncombined with meteorological and medical observations, on the physiological and pathological effects of localities and climate, and classified arrangement of the prevailing endemic diseases, they are but relative proofs of hitherto unremoved sources of such diseases. The first right step in this direction was the organization of a statistical branch of the medical department of the army, with the introduction of new forms of returns, after the Report of the Sanitary Commission of 1858; but a sufficient period has not yet elapsed for the production of those accurate and trustworthy statistical data, which we may confidently look for in the course of time.

Nevertheless well marked reductions in the death-rates of English

\* See pp. 16 and 141 of the "Army Sanitary Report," 1860.

troops, serving abroad, have been effected. During the period anterior to 1836, the rates for the Mediterranean stood as follows:—

Gibraltar .....	22'0 deaths per 1,000 men.
Malta .....	18'7       ,,
Ionian Islands .....	28'3       ,,
Mean death-rate .....	<u>23'5</u> ,,

During the period from 1844 to March, 1846, the mortality had fallen to the following numbers:—

	Effective Mean Strength.	Mortality.			Death-rate per 1,000 Men.
		1844.	1845.	Total.	
Gibraltar .....	3,371	41	41	82	12'2
Malta .....	1,858	36	31	67	18'
Ionian Islands .....	2,537	35	33	68	13'4
Total for the Medi- terranean..... }	7,766	112	105	217	14'5

For the period again 1859 and 1860, the diminution stood thus:—

	Effective Mean Strength.	Mortality.		Death-rate per 1,000 Men.
		1859.	1860.	
Gibraltar.....	5,381	40	62	9'41
Malta .....	5,630	101	63	18'8
Ionian Islands .....	3,875	46	29	9'8
Mediterranean .....	14,886	187	154	12'6

The results of these two last periods present in their favour, when compared with 1836, the following diminution of the mortality:—

Gibraltar .....	11'2 deaths per 1,000.
Malta .....	0'3       ,,
The Ionian Islands .....	11'2       ,,
Mean for Mediterranean .....	<u>7'5</u> ,,

The annual mean difference being a gain of 16 men per 1,000 of the effective strength in our healthy colonial commands.

Turning to British possessions, reputed the most unhealthy, we find according to Sir A. Tulloch's statistical investigations, and the Army Report 1860, that the results of sanitary ameliorations there have been yet more striking and satisfactory; and have followed measures for abandoning low, undrained, and filthy stations, and occupying the higher ground as the sites of well constructed barracks and hospitals, with attention to all other sanitary precautions, that have of late years been deemed necessary for securing the health of our soldiers abroad. The colonies, in which such improvements have been carried out, are Mauritius, Jamaica, the Antilles with British Guiana, and Ceylon. Previous to 1836, the mean mortality of our forces occupying these colonies, was 84·2 per 1,000; which, during the period from 1844-45, on an effective strength of 7,194 men, had been reduced to 42·1 per 1,000; and in the last year 1860, for which we have authentic returns, the mean mortality, including invalid deaths of the four stations, was only 17·57 per 1,000 of the effective mean strength. In applying the mortality-rate, before 1836, to an effective strength of 7,194 men, it will be found that we permitted 1,212 of these to die annually; but from 1844 to 1845, only 606 died; and in 1860 less than 303, being more than an annual saving of life of 1,000 men for every effective force of 7,194 soldiers. In proof of the mortality-rate for 1860, it may be well to here append, from the "Army Statistical Report," the particulars of those four colonies:—

	Effective Mean Strength.	Mortality, 1860.	Death-rate per 1,000.
			Mean.
Mauritius .....	1,886	45	23·86
Jamaica .....	594	12	20·20
Antilles and Guiana .....	1,255	7	5·58
Ceylon.....	916	18	19·65
Total .....	4,651	82	17·17

With regard to India it is, as M. Boudin remarks, that part of the English army over which military authority has not hitherto exercised any control, regarding the choice of places of encampment, or the duration of residence in certain insalubrious localities, and the relief of the troops. I would speak, says he, of the East Indian army, as that part of the British army, which is far from having gone through those sanitary ameliorations, which have comparatively followed the rules of *hygiène*. The following table epitomizes, for



the years 1845 and 1846, the effective strength of European troops, and the rate of mortality, in each of the three presidencies of Bombay, Madras, and Bengal:—

		Effective.	Deaths.
Bombay, 1845 .....		6,324	824
„ '46 .....		4,710	337
Madras, 1845 .....		7,850	276
„ '46 .....		7,535	351
Bengal, 1844 .....		11,003	1,028
„ '45 .....		11,280	984
Total .....		48,702	3,800

According to this document it follows that from an effective mean of 24,351 men, 1,900 are lost annually by death, or 78 men per 1,000. Now though M. Boudin is perfectly correct as to the rate per 1,000 during those years, yet they formed the period of the Sikh war, and 27 or 28 for casualties of wounds, and war service in climates not Indian, ought to have been deducted therefrom, leaving the mortality, from natural causes, at 50 per 1,000. This is a further illustration of the necessity of avoiding all sweeping conclusions, as to the mortality-rate, without perfect records and knowledge of all contingencies influencing the results. Still the mortality-rate of 50 per 1,000, as caused by preventible causes, is much beyond what it ought to be for India. The Commissioners' Sanitary Report of 1863 presents, on this subject, an overwhelming amount of evidence, and without exaggeration shows that in India there has been a fatal neglect of the conditions which injure the health of soldiers and increase the mortality; and that the Indian Government have not hitherto carried out what was essential to improve the sanitary state and well-being of their soldiers.

It is but just to say, however, that no inconsiderable ameliorations of their sanitary state have been effected of late years, as the following statistical data indicate. The death-rates in India for five years, 1850-54, stood as follows for the three presidencies:—

Bombay.....	26'09	deaths per 1,000 men.
Madras .....	39'76	„
Bengal .....	55'56	„
Mean .....	40'4	„

In 1860, these proportions for the British Army, including invalids, were considerably reduced, giving a mean diminution of 9·3 per

1,000 of our soldiers. The admissions and deaths occurred in the following proportions, the mean mortality ratio per 1,000 being less than that in Table VI for 1861 :—

	Average Strength.	Admissions into Hospital.	Deaths.			Ratio per 1,000 of Mean Strength.	
			In India.	Of Invalids.	Total.	Admitted.	Died.
Bombay .....	11,388	22,013	332	29	361	1,933	31.70
Madras .....	10,696	15,901	193	49	242	1,487	22.63
Bengal .....	42,371	85,693	1,569	99	1,668	2,023	39.37
Total .....	64,455	123,607	2,094	197	2,271	5,643	31.1

In thus reviewing the rates of Indian mortality, and the sanitary ameliorations effected of late years for the British army, let us turn for a moment to consider the statistics of French military mortality under like conditions of climate and locality. I have already noticed that, for their tropical settlements of America and Africa, Table II sets down their mean mortality for ten years, 1838 to 1847, at 69.5 per 1,000. While the mean mortality of the civil population of France, at the soldier's age, is 12 per 1,000, that of the infantry of the line rises to 22.3. From 1819 to 1838, this in Senegal became 123.8, in Guadeloupe 101.3, in Martinique 102.8, in French Guiana 32.3, and in Bourbon 25.6 per 1,000. In Algeria, on an effective strength of 108,000 men for ten years, from 1837 to 1846, the mean death-rate was 75.8 per 1,000; from which probably the average casualty-rate for war and service ought to be deducted. This would reduce the mortality to nearly the same standard as for India; but whether such reduction is allowable, I know not, being altogether ignorant of the contingencies of that period. M. Boudin, however, adds that the simple comparison of the results, with those among English troops, proves better than all reasoning how much of the way is yet open for the French to accomplish in regard to military *hygiène*. In Table VII, which I have copied from him, regarding the losses of the French troops in Algeria 1846, it would appear that from an effective of 99,700 men, the deaths in the African hospitals were 68.8 per 1,000; and that the other casualties of discharged and sent to France, killed in battle, deaths in the hospitals of France, pensioned and invalided, amounted to 28.3; and would raise the total decrements of the troops to 97.1 per 1,000.

TABLE VII.—*Of the Losses of the French Troops in Algeria, for 1846, on a Mean Effective Strength of 99,700 Men.*

	Numbers.	Ratio per 1,000 Strength.
Admitted into the African hospitals .....	121,138	—
Number of days under treatment in Africa .....	2,497,181	—
Discharged and sent to France.....	2,089	20·9
Deaths in the African hospitals .....	6,862	68·8
Killed in battle .....	116	1·1
Deaths in the hospitals of France .....	246	2·4
Pensioned .....	130	1·5
Invalided .....	267	2·6

*The Sanitary Measures still necessary for English Troops in India.*

My great object by the preceding observations has been to show “that the present death-rate for the whole of India,” instead of being 69 per 1,000, as assumed in the Sanitary Commissioners’ Report, has been, for many years past, little more than half this rate of death from ordinary and natural causes; inasmuch as the above-mentioned high rate is not simply the *mortality*, but includes other rates of *decrement* from the effective strength, as those of *invaliding*, and of *extraordinary war-service*, in climates and localities not Indian. The high death-rate given is that of Bengal European troops, rather than that of soldiers serving at Madras and Bombay. It was chiefly caused by extraordinary war-service of the former, during the Cabul massacre and Afghan war, and in the Burmese and China campaigns. A comparison, then, of the death-rate of troops, so employed out of India, with the death-rate of troops more comfortably housed, and adequately provided in the garrisons and stations of India, is manifestly a vague representation of Indian mortality, and must necessarily mislead as to what that rate is. At the commencement of the report the death-rate among the Company’s troops, including invalids, from 1800 to 1856, is stated as 69 per 1,000; but while recapitulating this statement, at p. 165, it is said:—

“The annual death-rate for the whole of India has hitherto been “about 69 per 1,000. The proposed European establishment is 73,000 “men, and will, at the present rate of mortality, require 5,037 recruits “per annum, to fill up the vacancies caused by death alone.”

This rate of decrement, for both *mortality* and *invaliding*, might be certainly taken as a basis for correctly estimating the number of recruits hitherto necessary to fill up vacancies, but is not so for the mortality alone. Indeed, there is good reason to believe that 2,518, or half the Commissioners’ figures, would be sufficient to make good

the annual losses by death ; and are yet further susceptible of great reduction, by the introduction into India of improved sanitary appliances, adapted to climate, localities, and seasons, and with restraints on vice and intemperance. By the latest return of the British Army in India, exclusive of the late Company's troops, the death-rate had sunk to 35·3 per 1,000 ; and the invaliding, with deaths on the passage home, caused a further loss of 33·3 per 1,000 ; being altogether a decrement of the whole strength of 68·6 per 1,000. Invaliding, even at home, has hitherto caused a decrement of 32·3 per 1,000, so that this cause of loss in India is not greatly in excess.

While I have thus fairly stated my objections to the manner in which the Commissioners' Report has brought forward the death-rate of India as hitherto 69 per 1,000, I cannot help noticing the inconsistency of this assumption with the facts set forth in other tables, appended to the report ; Table IV of which shows that, for all India, 1847-56, it was only 51 per 1,000. This was seven years ago ; and from which time the ameliorations have been progressive.

In regard to other matters of the Report, the causes of sickness and mortality, and the means of preventing them, I entirely agree with the view taken by the Commissioners. 1st. That by far the larger proportion of the mortality and inefficiency of the Indian army has arisen from *endemic diseases*, and notably from fevers, diarrhœa, dysentery, cholera, and from diseases of the liver. 2nd. That the predisposition to these diseases is in part attributable to *malaria*, in conjunction with extremes of temperature, moisture, and variability. 3rd. But that there are other causes of a very active kind in India, connected with *stations, barracks, hospitals*, and the *habits* of the men, of the same nature as those which are known, in colder climates, to occasion attacks of these very diseases, from which the Indian army suffers so severely. In examining into these causes, we find, say they, that the stations generally have been selected without reference to health, and mainly from accidental circumstances, or for political and military reasons. Many of them are situated in low, damp, unhealthy positions, deficient in means of natural drainage, or on river banks close to unwholesome native cities or towns. Both barracks and hospitals are built at or close to the level of the ground, without any thorough draught between the floors and the ground. And the men, both in barrack-rooms and sick-wards, are exposed to damp and malaria from this cause, as well as from want of drainage. The ventilation is generally imperfect, and, from the arrangement of doors and windows, men are exposed to hurtful draughts. Many of the rooms are too high, and, as a consequence, there is much *surface overcrowding* both in barracks and hospitals, *although with large cubic space*.\*

\* "Report of the Commissioners, with Précis of Evidence," 8vo., pp. 160—162.

The greater or less *sickness and mortality* of all races in India are in proportion to the bad or good sanitary conditions, with moderate elevation of the site and localities where they live; and, in the present state of Indian drainage and agriculture, the Commissioners truly say, "that for all practical purposes, heat, moisture, and malaria are constantly present, and everywhere influencing the sanitary condition of the country, aided by filthiness of the stations, impurity of the air in certain stagnant states of the atmosphere, by surface overcrowding and want of ventilation in a barrack, by impurity of the water supplied, and occasionally unsuitable diet."

No stronger evidence can be given in support of the truth of the above conclusions, that those are the chief causes of disease among European soldiers in India, than the statistical data which show, the rates of sickness and mortality, *from miasmatic diseases*, are greater or less in proportion to the *unimproved* or *improved* sanitary condition of places and localities. In the Bengal and North West presidencies, the most malarious districts of India, the mortality for Dum Dum and Calcutta is cited at 77 per 1,000; at Hazareebagh, 1,900 feet above the sea, during two years, 34 in 1,000; at Meerut, for nineteen years, 32 per 1,000; and Jullunder, 37 per 1,000.

The most frequent cause of epidemic outbreaks of Indian cholera and fever will, I believe, be found in certain stagnant conditions of the atmosphere, which favour the *accumulation of putrid animal matter* in the air of barracks and of stations, rendering it impure. When, in addition to this cause, bad food and bad water are allowed to contribute their share in impairing the nutrition of the system, and sapping the foundation of bodily strength among troops, the very worst features of sickness and mortality among them become manifest. These facts are prominently set forth in Dr. Hathway's Punjab Sanitary Report, lately published; where he judiciously recommends that all barracks should be provided with flues, and that the barrack air should be, at all times, tested by an instrument invented by Dr. Angus Smith.

The great defect, in most Indian barracks, is that the *superficial area* per bed by no means corresponds with the cubic contents, and is sure to be followed by all the disastrous effects of *surface overcrowding*, when larger numbers of European soldiers are assembled at stations, than can be conveniently accommodated in the barracks and hospitals.

European troops are exposed to other causes of disease than those before enumerated; such as *intemperance* and *syphilitic* diseases. And while both greatly increase the numbers on the sick list, they ultimately tend to swell the rates of *mortality* and *invaliding*. They are not, indeed, the more *immediate* and *chief* causes of Indian mortality, though contributing largely to it, and should never

be allowed to withdraw sanitary attention from those more general and prominent causes of sickness and mortality that require special measures of prevention.

With a view of removing all preventible causes of disease in India, the Commissioners' recommendations are embodied in thirty-nine suggestions, which are set down without any order as to the importance or priority of either. Having endeavoured to point out, in the preceding observations, that diseases of miasmatic origin are the main causes of the mortality, I may enumerate in abstract the more prominent of these suggestions, and in their relative order of importance.

*First.* As to *morbid causes*, associated with *season, localities*, and *barracks*, the Commissioners recommend—

That no recruit be sent to India under twenty-one years of age, nor until he has completed his drill at home; and that recruits be sent direct from home to India so as to land there early in November.

That the strategical points of the country which must be occupied, be now fixed, with special reference to reducing, as far as possible, the number of unhealthy stations to be occupied.

That hill stations, or stations on elevated ground, be provided; and that a third part of the force be there located in rotation.

That the period of service be only ten years in India.

And, That the sanitary regulations, now in force in England, be applied to India, along with the extension, to all Indian stations, of the present system of army statistics, and a code of sanitary regulations issued under authority.

In connection with this part of the subject there are also recommendations for remedying defective drainage, for supplying pure water, for erecting barracks and hospitals on raised basements, with air circulating under the floors; that the ventilation of barracks and hospitals be sufficiently secured independently of doors and windows; and that ablution and bath accommodation be provided for both these classes of buildings.

*Second.* In regard to *dietetic errors* and *clothing*, they recommend—

That no spirits be issued to troops on board ship, except on the recommendation of the medical officer in charge.

That the sale of spirits at canteens be discontinued, except in specific cases, on the recommendation of the medical officer, and only malt liquor or light wines allowed.

That the rations be modified to suit the season; and that flannel be introduced as under-clothing, and a better system of supplying boots introduced.

That the hospital diet tables, in use at home stations, be adopted in India, as far as practicable, and the hospitals supplied with properly-trained cooks.

*Third.* In regard to *exercise and recreation*, it is recommended—

That the means of instruction and recreation be extended to meet the requirements of each station. That covered sheds for exercise and gymnastics be provided, and that such gymnastic exercises be made a parade. That reading-rooms, with books and periodicals, be provided, and lighted at night. That only coffee, tea, and other non-intoxicating drinks be sold to the men at those rooms. And that workshops and soldiers' gardens be established, in connection with the stations, wherever practicable. And lastly, that soldiers of good character should be selected and educated for subordinate offices of the administrative departments.

*Fourthly.* That, with the most reasonable hope of *lessening intemperance*, and *diminishing the prevalence of syphilitic diseases*, the soldiers' condition in the way of occupation, instruction, and recreation be improved, as the most moral and rational means of leading men away from the canteen and vice. They also recommend that additional means of cleanliness should be provided for the men in all barrack lavatories; and that the *reorganization of repressive measures of police*, formerly adopted in the three presidencies, for lessening the scourge of syphilitic diseases, should be carried out, according to the necessities of each locality. Although police supervision of prostitution for the large cities of Europe has proved an entire failure, yet the condition of native society in India is such as to promise better and less embarrassing expectations of success.

*Fifthly.* That, in order to secure the gradual introduction of the above-mentioned sanitary improvements for barracks, hospitals, and stations, whether at the seats of Government, or throughout towns in proximity to military stations, "*Commissions of Public Health*" should be appointed, and that they should be so constituted as to represent the various elements of civil, military, engineering, medical, and sanitary knowledge.

Sir Hugh Rose, the Commander-in-Chief in India, by issuing orders, in July last, headed "Sanitary and Conservancy Regulations," has, in a great measure, anticipated the practical execution of this last recommendation for Bengal, where it was most needed, and will probably be followed by correspondingly-successful results.

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